COMMON SEA SHELLS

OF THE

Los Angeles County Coast

By

HOWARD R. HILL and PAULINE D. TOMPKINS

THE LOS ANGELES COUNTY MUSEUM — 1954

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PHOTOGRAPHS
by
STEPHEN F. BIRCH and LEWIS H. ATHON

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COMMON SEA SHELLS OF THE LOS ANGELES COUNTY COAST

The sea shells that are found on the beaches of Los Angeles County are the hard parts of invertebrate animals called "Mollusks." Like all other animals they begin life as tiny eggs. Upon hatching they are soft-bodied and soon start building their shells which serve as a protection. Calcium (lime) is obtained from sea water and the shells are thickened and enlarged as the animals grow. You may find "dead" shells on the shore from which the mollusk animals have disappeared after death, and "live" shells that still contain the living animals.

The bivalves (*Pelecypoda*) are mollusks with two shell parts or valves which in life are attached by a hinge and interlocking teeth.

The univalves (*Gastropoda*) are mollusks with shells of one part, usually coiled as in our common garden snail.

Multivalves (*Amphineura*) have many interlocking plates, usually eight in number, as in the Chitons or Coat-or-Mail Shells.

Scaphopods have slender, tube-like shells which are without whorls and taper toward one end. The shells are slightly curved and open at either end.

Although there are over a thousand different kinds of mollusks found along our coast, a great many are rare or occur in such deep water as to be seldom seen.

This handbook describes briefly and illustrates some of the more interesting species that visitors to our nearby shore-line are likely to come across. It is hoped that it will be useful as a ready means of identification for the common shells herein included.

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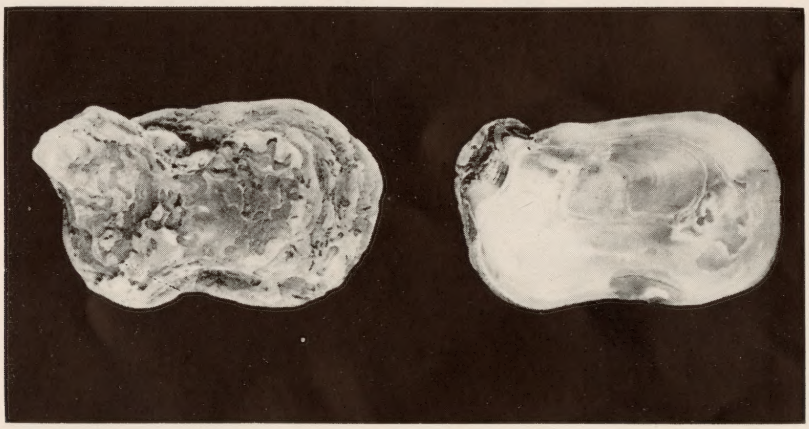
BIVALVES—CLASS PELECYPODA

OYSTERS—Family *Ostreidae*

A family in which the shells vary greatly in shape. Most of them are irregular in form and ornamented with plaits and ridges. The shells are often nacreous or silvery on the inside. No hinge-teeth are present. Foot absent. Attached by left valve to rocks, piling or dead shells. Live in shallow water and feed on microscopic plants and animals brought into their shells by water currents.

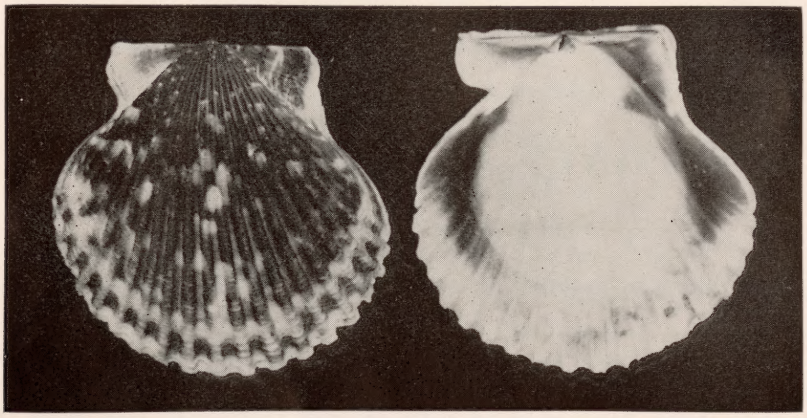


NATIVE OYSTER—*Ostrea lurida* Carpenter

Irregular in shape. Found attached to shells, pilings, rocks and submerged pieces of wood. Lower valve often fastened securely. Not utilized for food locally. Color: grayish-white. Size: 2 inches in length. Common in bays and inlets. This oyster is propagated to a considerable extent in Puget Sound and marketed in the northwest. It is often called Olympia Oyster.

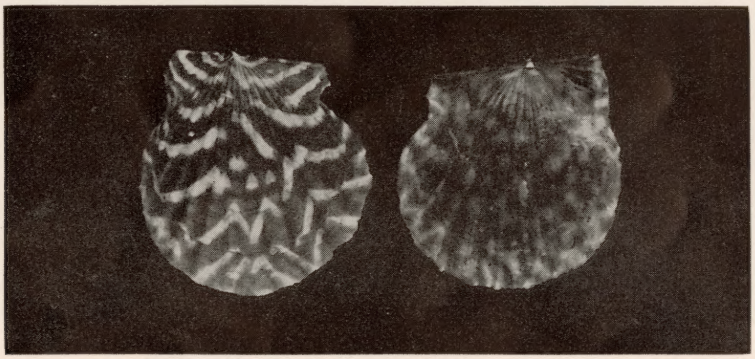
PECTENS—Family *Pectinidae*

The Pectens are sometimes called "Scallops" or "Fan" Shells. They are able to move through the water by flapping their valves. However, they seldom swim and are usually found partly embedded in sand or attached to rocks or sea weed. The white muscles which hold the valves together are sold in the markets as Scallops and are delicious when fried.



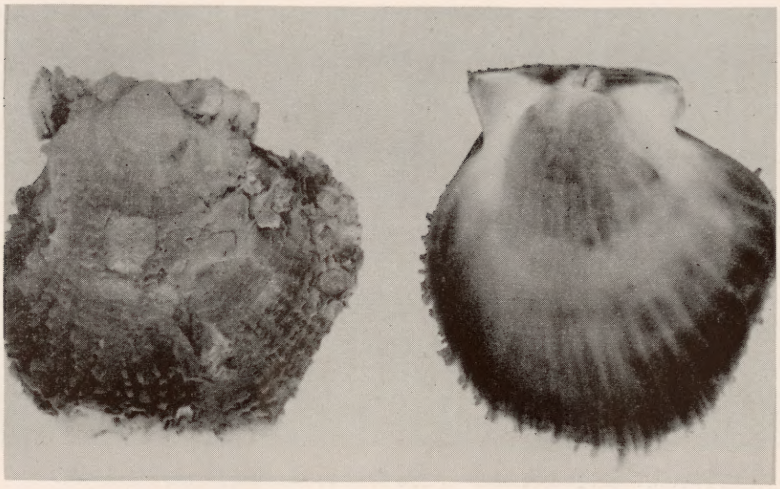
SPECKLED PECTEN—~~*Plagioctenium*~~ *circularis aequisulcatus* Carpenter
Aequipecten

Lives on sandy bottom in bays or off shore. Common on sand flats. Many loose valves wash up on southern California beaches. Color: white, striped and blotched with grayish-black. Size: 3 inches in diameter.



BROAD-EARED PECTEN—*Leptopecten* ~~*latiauritus*~~ Conrad
monotimeris

A small species with thin valves, found attached to off-shore kelp, eel grass, pilings and underside of floats. The "ears" are wide and unequal. Fourteen ribs are present. Color: some individuals entirely salmon-colored; others brown with narrow, white cross-bars arranged in jagged design. Size: 1½ inches in diameter.

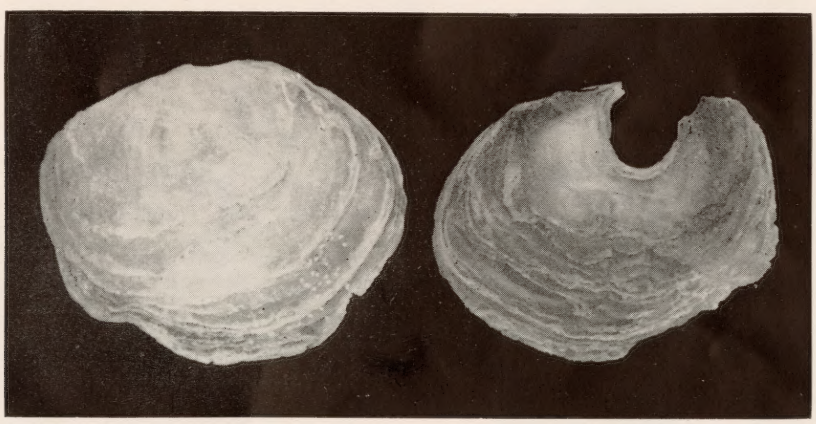


PURPLE-HINGED PECTEN—*Hinnites multirugosus* Gale

Largest of the Pectens, sometimes reaching a length of 6 or 7 inches. Easily identified by the purple stain on the inside of each valve near the hingle line. Usually quite irregular in shape when full grown. Lives attached to rocks and pilings near shore. Color: reddish-brown. Size: 6 inches in length.

JINGLE SHELLS—Family *Anomiidae*

Called Jingle Shells because their valves are light and have a metallic ring when shaken together. The lower valves are seldom seen on the beaches because they remain fastened to rocks during rough weather, when upper valves are washed away. Lower valves have a central opening through which the byssus passes from the animal to the point of attachment.



COMMON JINGLE SHELL—*Anomia peruviana Orbigny*

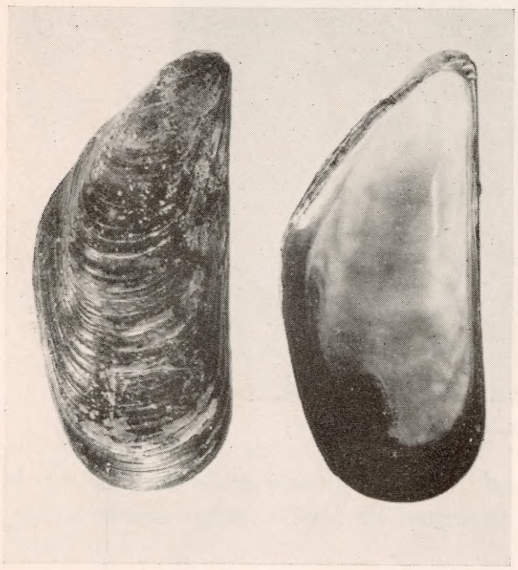
Also called Devil's Toe-nail Shell and Potato Chip Clam. Upper valves wash up on sandy beaches by the thousands. Color: varies from light yellow to golden. Lead-gray and black valves are due to staining by crude oil. Size: 2 inches in diameter.

PEARLY JINGLE SHELL—*Pododesmus ~~macroschisma~~ ~~Deshayes~~* Cepio Gray

Lives attached by lower valve to rocks and piling. Irregular ridges on upper valve, which is wider than lower valve. A larger and heavier shell than the common Jingle. Color: outside gray; inside pearly green. Size: 3 inches in diameter.

MUSSELS—Family *Mytilidae*

Elongate bivalves of dark color. Some species provided with a byssus for attachment; others live in cavities in shells and rocks. Skin layer, or periostracum, covers outside of valve. Brown hairs are often present on periostracum.



CALIFORNIA MUSSEL—*Mytilus californianus* Conrad

A common species growing in colonies on pilings and floats or attached to rocks on outside beaches. Preyed upon by starfiishes. Edible during cool months of the year. Shell becomes thick and heavy with age. Valves ridged on the outside. Color: black. Size: average length 7 inches.

BAY MUSSEL—*Mytilus edulis* L.

Also found on European coasts. In recent years, has become exceedingly common in local bays and inlets. Valves smooth on the outside. Lives attached by byssus to wharves, rocks, piling, floats and buoys. Color: blue-black. Size: 2½ inches in length.

BRANCH-RIBBED MUSSEL—*Septifer bifurcatus* Conrad

Lives attached to underside of rocks. Outside of valves sculptured by radiating ridges which divide near the margins. A small, white, plate-like deck present within each valve, near the umbonal end. Color: blackish. Size: 1½ inches in length.

HORSE MUSSEL—~~*Volsella*~~ Modiolus *capax* Conrad

Shell swollen and hairy. Lives in clusters attached to piers, pilings and rocks. Color: glossy-brown. When periostracum is removed, shell is brick-red. Size: 5 inches in length.

Modiolus
STRAIGHT MUSSEL—~~*Volsella*~~ *recta* Conrad

Shell long, narrow and thin. Hairy at one end. Lives partly buried in mud or gravel in bays and inlets. Attached by a byssus. Color: brown outside and white within valves. Size: 6 inches in length.

ROCK-DWELLING MUSSEL—*Lithophaga plumula* Hanley

Lives in burrows in large shells like abalones and Purple-hinged Pectens and in cavities in soft shale rock. Radial grooves extend back from beaks. Shell slender, cylindrical, tapering toward posterior end, rounding in front. Color: brown. Size: average length 2 inches.

LANTERN SHELLS—Family *Periplomatidae*

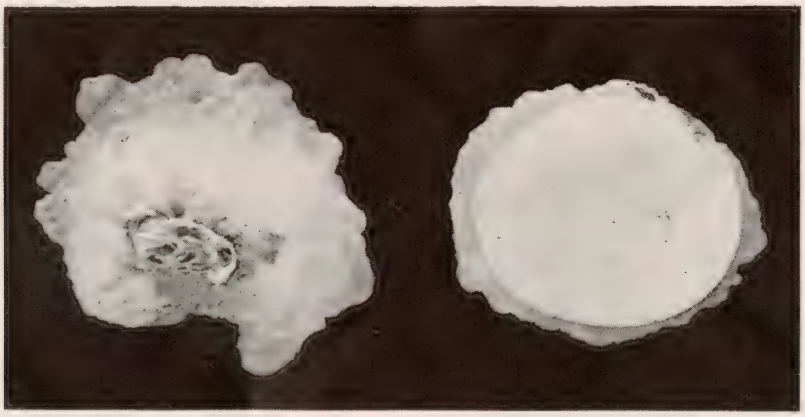
Thin shells with shining, silvery interior. Spoon-shaped tooth within each valve near umbo. Live on outside sandy bottoms.

SILVER LANTERN SHELL—*Periploma planiuscula* Sowerby

Right valve inflated; left valve flattened. Color: white; interior, silvery. Size: 2 inches in length.

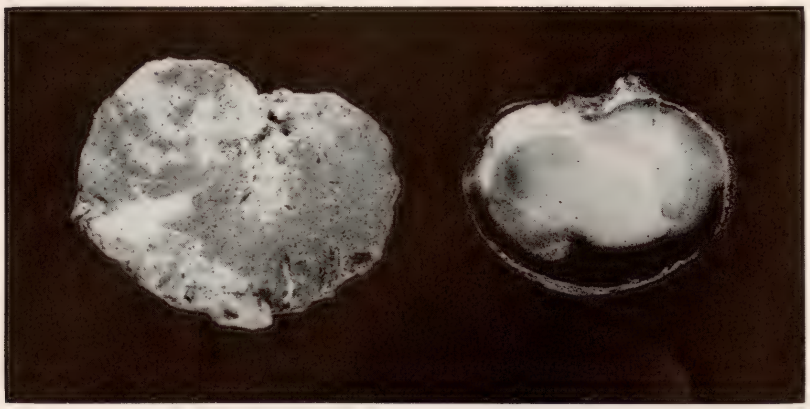
ROCK OYSTERS—Family *Chamidae*

Thick, roughly sculptured shells which cement themselves to the rocks. Attached singly or in clusters, often growing on each other. Usually covered with dirt or other foreign material.



AGATE ROCK OYSTER—*Chama pellucida* Broderip

Shell with texture of agate, frilled with rows of flat plates. Color: translucent white, tinged with pink. Size: 1½ inches in diameter.

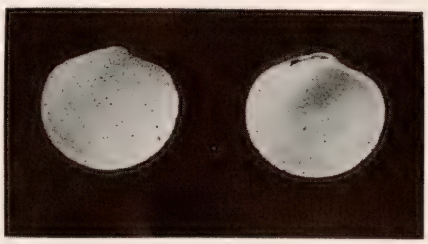


REVERSED ROCK OYSTER—*Pseudochama exogyra* Conrad

Attached by the left valve. Spiny frills not well developed as in the Agate Rock Oyster. Upper valve smaller than lower valve. Color: dingy white. Size: 2 inches in diameter.

ROUND CLAMS—Family *Diplodontidae*

Globular clams with smooth shells and double ligament.

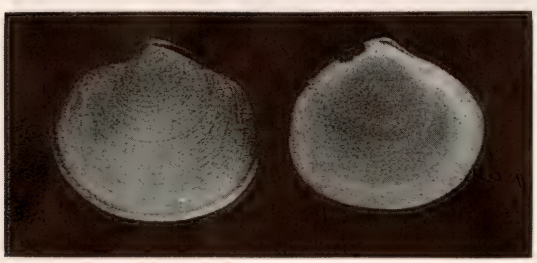


Diplodonta
ROUND CLAM—~~*Taras*~~ *orbella* Gould

Shaped like a marble. Secretes a tube or nest of sand and mucous for protection. Lives in sand pockets in rocky localities. Color: white: Size: 1 inch in diameter.

LUCINE CLAMS—Family *Lucinidae*

Clams of circular shape, sculptured with striations and concentric raised lines. Hinge teeth feebly developed.

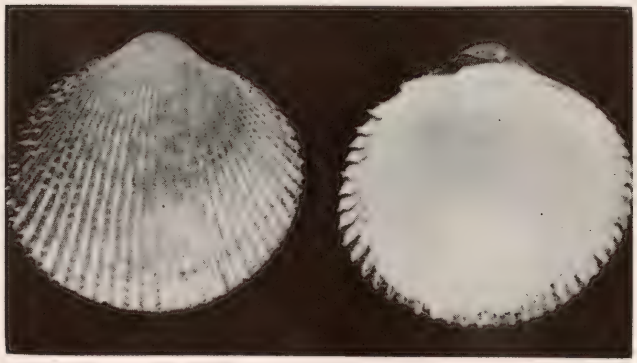


CALIFORNIA LUCINE
~~*Lucina*~~ *californica* Conrad
Epilucina

Lives in gravel pockets in rocky localities. Color: white: Size: 1½ inches in diameter.

HEART CLAMS—Family *Cardiidae*

Shells heart-shaped and radiately ribbed. Live on sandy or mud bottoms. Two cardinals and one lateral tooth in each valve. Ligament external.

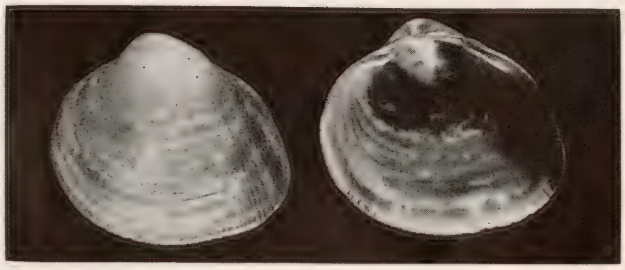


FORTY-RIBBED HEART CLAM
Trachycardium quadragenarium Conrad

Forty spiny, radial ribs extend from umbonal region to edge of each valve. Valves inflated. Lives in deeper part of bays. Color: brown. Size: 4½ inches in heighth and slightly less in length.

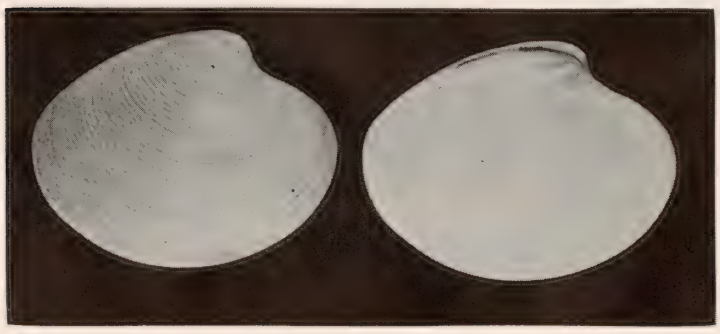
EGG-SHELL CLAM
Laevicardium substriatum Conrad

An oval, inflated species with thin smooth valves. Lives in bays, in shallow water on muddy or sandy bottom. Easily collected by shovelling sand through screen. Color: yellow, mottled with brown spots. Size: 1 inch in length.



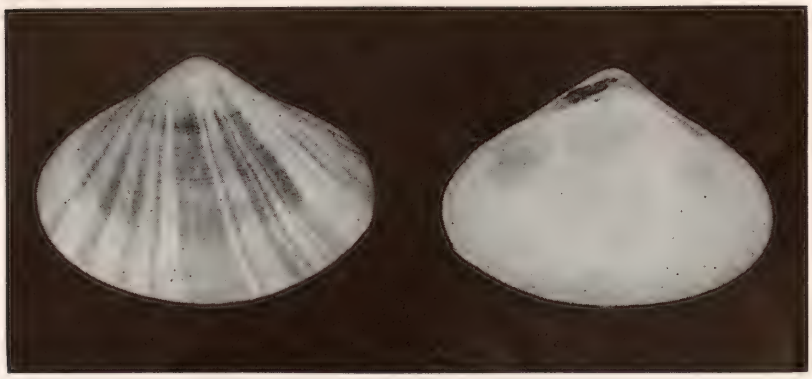
VENUS CLAMS—Family *Veneridae*

A large family, with most species living embedded in sand. Large prominent hinge teeth are characteristic features. Many are sculptured with ridges and radiating growth lines.



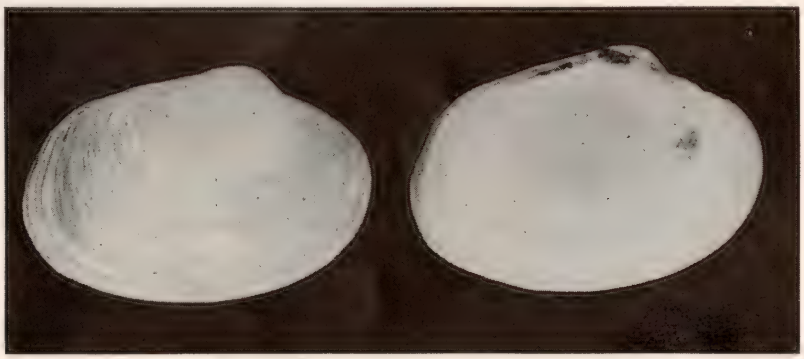
SEA COCKLE
Amiantis callosa Conrad

Lives at moderate depth off outside beaches on sandy bottom. Valves thick, ornamented with raised concentric ridges. Color: glossy white. Size: 4 inches in length.



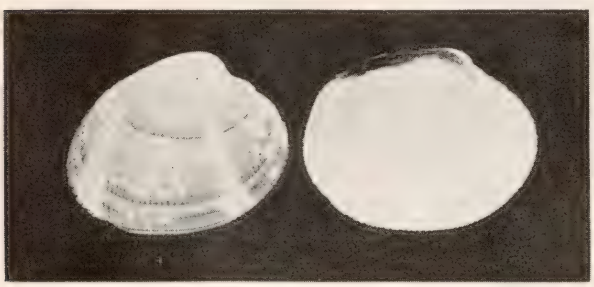
PISMO CLAM—*Tivela stultorum* Mawe

Triangular in shape. A thin skin or epidermis covers the smooth outside. Valves thick and heavy in full grown individuals. Lives in moderate depth in firm sandy bottom. Color: tan or light yellow, sometimes striped with brown, radiating from umbo to border of valves. Size: reaching a length of 7 inches, but average size is 3 to 4 inches. Used for food.



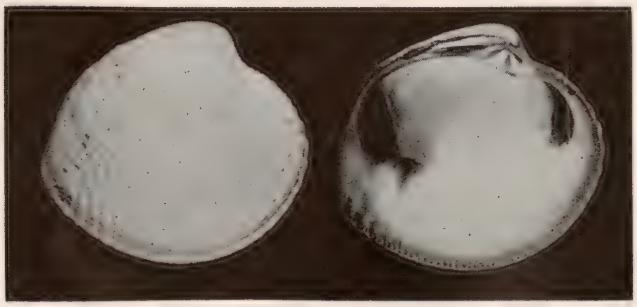
WASHINGTON CLAM—*Saxidomus nuttalli* Conrad

Lives in bays and sloughs, buried in mud just beyond low tide line. Valves thick and ridged by concentric growth lines on the outside. Useful for food. Color: grayish-white. Size: 5 inches in length.



LITTLENECK CLAM
Protothaca staminea Conrad

A very common Venus clam which lives in the sand on outer rocky beaches and in bays. Valves not thick as in the Cockles. Burrows to depth of 6 to 8 inches. Color: yellowish-white, with or without brown V-shaped markings. Size: 3 inches in length.



SMOOTH COCKLE
Chione fluctifraga Sowerby

A heavy shell with no distinct lunule. Radiating ribs more prominent than concentric growth lines, especially at posterior end of each valve. A firm, heavy cockle, the largest of our local Chiones. Color: outside white, inside with purple border and purple over muscle impression. Size: 2½ inches in length.

WAVY COCKLE
Chione undatella Sowerby

The most common Chione in Anaheim and Newport Bays. In this species the concentric ridges are wavy and are closeset toward the margin of the valves. Color: white. Size: 2 inches in length.

BANDED COCKLE—*Chione californiensis* Broderip

Lives in the mud flats of bays and estuaries. A heavy compact shell in which the concentric ridges of the outer surface of the valves are wide apart and slightly reflexed. Color: white. Size: 2½ inches in length.

ROCK-DWELLING CLAMS—Family *Petricolidae*

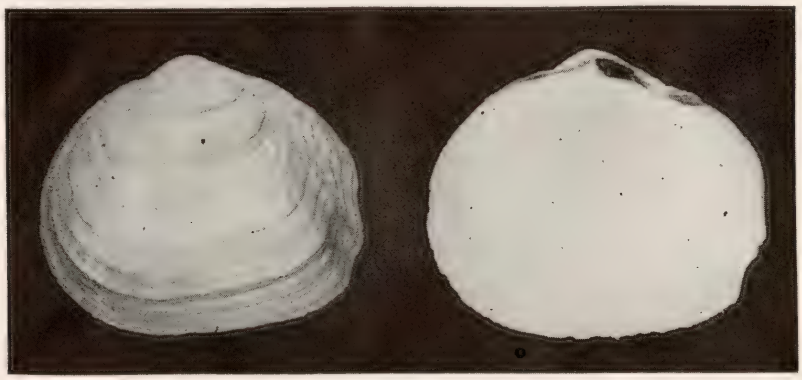
Clams of this family occur in burrows in rock and shale or in kelp holdfasts. They are frequently distorted and vary greatly in shape, usually, assuming the shapes of the cavities in which they live.

ROUGH ROCK-DWELLING CLAM—*Petricola pholadiformis* Lamarck

Shell elongate. Valves with fine radiating ribs crossing concentric lines of growth. Most frequently found living in burrows in soft shale along rocky beaches. Color: tan. Size: 1½ inches in length.

TELLIN CLAMS—Family Tellinidae

The Tellin Clams live in sand and mud in shallow water. The family is a large one, with most species living in the tropics. The shells are smooth and flattened and vary in color from white through yellow to pink.



YELLOW METIS CLAM—~~*Apolymetis*~~ *biangulata* Carpenter
Psammotheta

A moderately large, circular clam which lives in sand and coarse gravel on outer beaches. Valves are unlike and bent to one side. They are covered by a periostracum. Color: outside, brown; interior, yellow. Size: 3 inches in length.

BENT-NOSED CLAM—*Macoma nasuta* Conrad

Common in muddy bays, living several inches below the surface. Smooth, flat valves are bent to the side. Periostracum present. Color: grayish-white. Size: 2½ inches in length.

WHITE SAND CLAM—*Macoma secta* Conrad

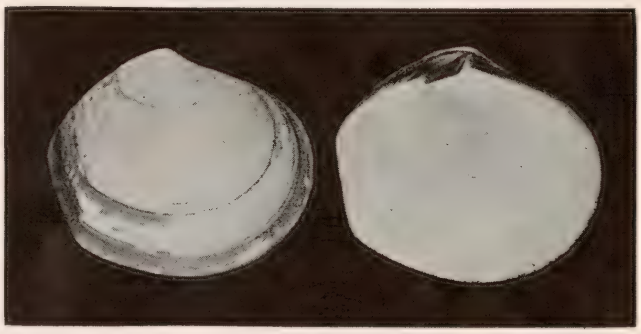
A thin, flat shell with faint growth lines. Lives in the outer edge of the surf line, on outside sandy beaches. Buries 1½ feet below surface. Color: white. Size: 4 inches in length.

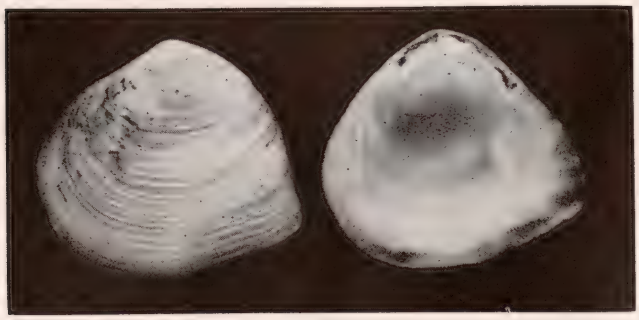
THE SEMELE CLAMS—Family *Semelidae*

Clams with an oblique, internal cartilage pit in each valve. Interior of valves have porcelain texture.

CLIPPED SEMELE—*Semele decisa* Conrad

Outside of valves wrinkled with thick, coarse concentric ridges. Posterior side appears to be clipped off—hence the name. Lives in coarse sand and gravel along rocky beaches of outer coast. Color: outside brown with tinge of purple around the interior edges of the valves. Size: averages 3 inches in length.



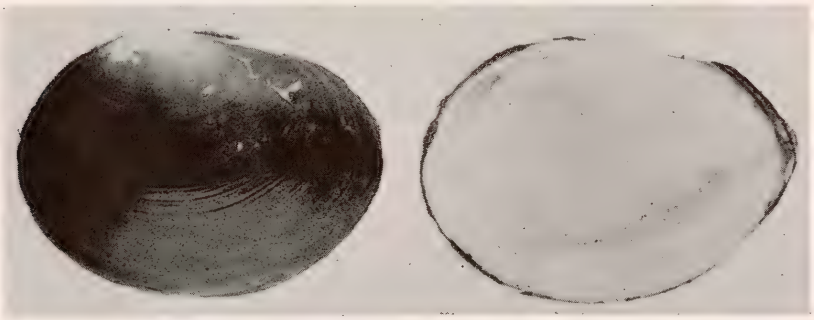


CUMING'S CLAM
Cumingia californica Conrad

Valves roughly sculptured externally with coarse lines of growth. Lives in mud pockets in rocky localities. Often found within the sediment enclosed in larger dead bivalves. Color: white. Size: 1 inch in length.

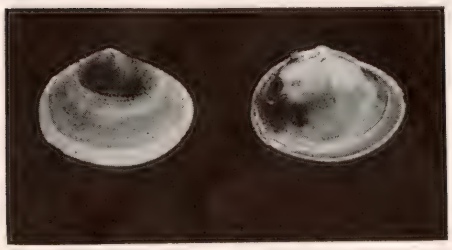
SAND CLAMS—Family *Garidae*

Shells with a long external ligament. Live in sandy locations.



PURPLE CLAM—*Sanguinolaria nuttallii* Conrad

Burrows to depth of 1 foot in sand and gravel in bays and inlets. Used as food. Color: purple under a yellow, shining periostracum. Interior of valves purple. Size: 4 inches in length.



SPOTTED HETERODONAX—*Heterodonax bimaculata* L.

Lives in colonies in bays. Easily collected by screening mud and sand. Color: varies from white to purple, often striped with reddish-brown. Size: 1 inch in length.

JACK-KNIFE CLAM
Tagelus californianus Conrad

Lives in burrows 10 to 15 inches deep, in sand or muddy bays. Used for fish bait. Color: gray, with brown periostracum covering outside of valves. Size: 4 inches in length.

RAZOR CLAMS—Family *Solenidae*

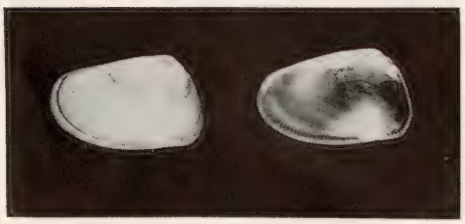
Narrow elongate shells with a glossy, brown periostracum. Valves gaping at each end.

BLUNT RAZOR CLAM—*Solen sicarius* Gould

Valves round at one end. Umbones near anterior end. Lives a foot below surface on sandy shores. Color: yellowish-brown. Size: 3 inches in length.

WEDGE CLAMS—Family *Donacidae*

Small, compact, triangular clams with short ligament and short siphons.



BEAN CLAM—*Donax gouldii* Dall

Common on outside sandy beaches. Umbones toward one end of valves. Color: white to purple, often marked with radiating dark stripes. Size: 1 inch in length.

CALIFORNIA WEDGE CLAM
Donax californica Conrad

Lives in bays or near entrance to inlets not exposed to surf. Not as common as the Bean Clam. Color: yellow. Size: 1 inch in length.

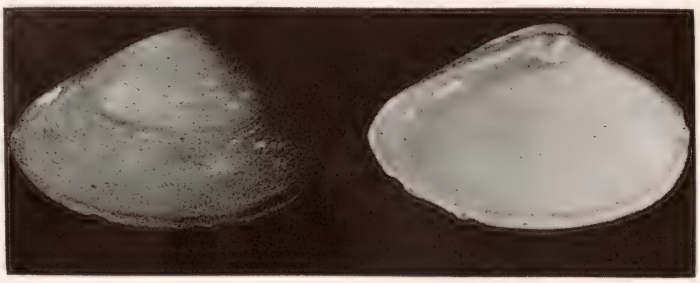
DISH CLAMS—Family *Mactridae*

Shells of this family are distinguished by the triangular, spoon-shaped pit between the hinge teeth in each valve. A brown periostracum is present on the outside surface of the valves.

GAPER CLAM
~~*Schizothaerus*~~ *nuttallii* Conrad
Tresus

Burrows to a depth of several feet in sandy mud in bays and sheltered coves. Valves gape widely at posterior end. The largest local bivalve, reaching a length of 8 inches. Color: white.

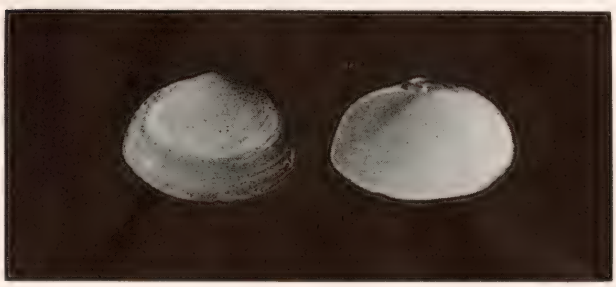
CALIFORNIA DISH CLAM
Mactra californica Conrad



A bay clam living in sandy mud. Can easily be recognized by the furrows near the beaks. Color: white. Size: 2½ inches in length.

FLAT-TOOTH CLAMS—Family *Myacidae*

Sand-loving clams that have a characteristic, spoon-shaped hinge-tooth. Live in soft shale and clay banks in bays and along outside beaches.



FALSA MYA
Cryptomya californica Conrad

A thin, smooth shell with valves slightly gaping at posterior end. Color: white. Size: 1½ inches in length.

FLAT-TOOTH CLAM—*Platyodon cancellatus* Conrad

A larger and thicker shell than the False Mya. Concentric lines of growth well developed. Shell truncate at each end and gaping at posterior end. Spoon-shaped hinge-tooth prominent. Color: white. Size: 3 inches in length.

PIDDOCKS—Family *Pholadidae*

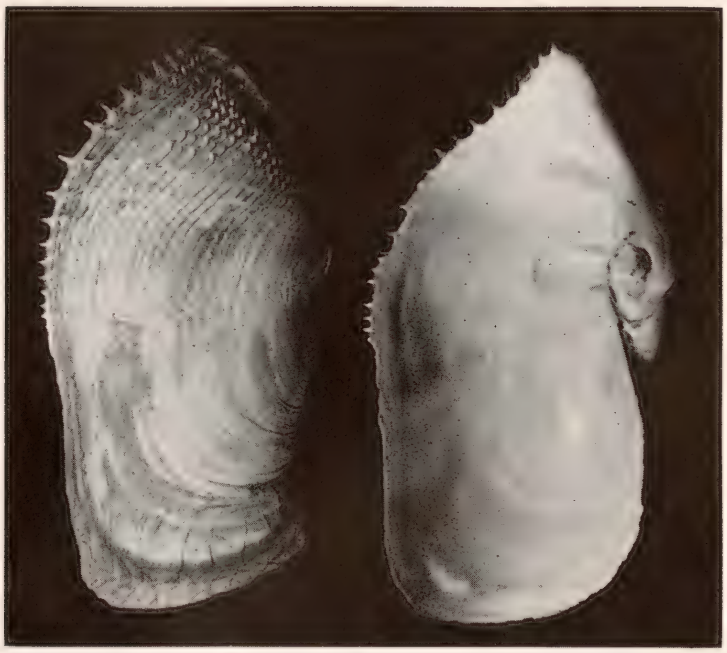
Bivalves with rows of small rasp-like teeth on the outer surface of the forward end of each valve. Internally, below the umbones, a spoon-like projection is present. Piddock burrows are common in shale, clay and in clams with thick shells.

ROCK PIDDOCK
~~*Pholadidea*~~ *penita* Conrad
Rovitella

Bores into sandstone, shale and hard clay. Scaly periostracum over posterior end. Triangular plate covers hinge area. Often bores into concrete jacketing of piles. Color: grayish-white. Size: 2½ inches in length.

CALIFORNIA PIDDOCK
Parapholas californica Conrad

Bores in sandstone and shale. 2 long, narrow plates situated over hinge area. Color: grayish-white. Size: 3 inches in length.



ROUGH PIDDOCK—*Zirfaea pilsbryi* Lowe

Lives in mud, clay and soft shale. Enlarges its burrow by rotating its shell. Color: white. Size: 5 inches in length.

TEREDOS OR SHIPWORMS—Family *Teredidae*

Live in tubes in wood, such as piling, logs, bottoms of ships and under part of floats. Valves at front end of tube. Opening of burrow closed by shell-organs called pallets.

NORTHWEST SHIPWORM—*Bankia setacea* Tryon

Pallets resemble ear of wheat. Shell saddle-shaped, finely striated. Color: white. Size: 1½ inches in length. A common wood-borer in local waters. Very destructive to piling.

UNIVALVES—CLASS GASTROPODA

BARREL SHELLS—Family *Acteonidae*

Small cylindrical shells with elongate aperture and pointed apex. A single, transverse fold within inner lip.

LITTLE BARREL SHELL—*Acteon punctocaelata* Carpenter

Lives buried in sand off outer beaches. Encircled with punctate grooves. Color: white, crossbanded with two black stripes. Size: ½ inch in length.

BUBBLE SHELLS—Family *Bullidae*

Inflated, fragile shells with sunken spires and expanded outer lips.

CLOUDY BUBBLE SHELL
Bulla gouldiana Pilsbry

Common on mud flats in summer months. Largest of the local Bubble Shells. Color: grayish-brown, spotted with black dots and light V-shaped markings. Covered by a thin, yellow epidermis. Size: 2 inches in length.

BUBBLE SHELLS — Family *Akeridae*

Smaller and thinner than Cloudy Bubble Shell.

GREEN BUBBLE SHELL—*Haminoea virescens* Sowerby

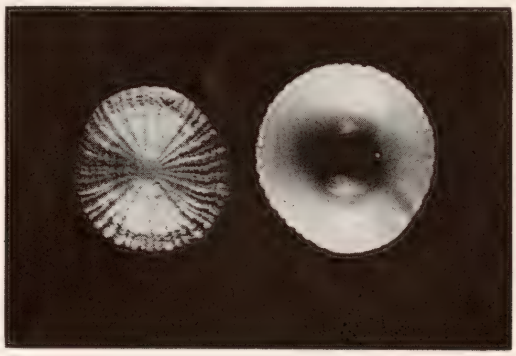
Shell thin, semitransparent and very fragile with widely expanded outer lip. Lives among sea-weeds along rocky beaches. Color: light green. Size: slightly over ½ inch in length.

TENT SHELLS—Family *Trimusculidae*

Circular, tent-shaped shells that live attached to rocks on outer beaches. Horseshoe-shaped muscle impression on inner surface.

NETTED BUTTON SHELL
Trimusculus recticulatus Sowerby

Surface reticulated by radiating ribs and transverse striations. Color: white except when tinged pink or green by algae. Size: ½ inch in diameter.



CONE SHELLS—Family *Conidae*

Cone-shaped shells covered with a periostracum. The aperture is elongate in all species.

CALIFORNIA CONE SHELL—*Conus californicus* Hinds

Lives in rocky locations, crawling about in rock crevices and under sea-weeds. Color: reddish-brown. Size: averages 1 inch in length.

DRILL SHELLS—Family *Turridae*

Shells of this family are sometimes called Notch-side shells because of an incurved notch on the outer lip. The spire is elongate and the sculpture consists of axial ridges and transverse lines.

PENCILLED DRILL SHELL
Ophiodermella ophioderma Dall

Lives in sand on outer beaches. Shell with thin outer lip and short canal. Color: brown with reddish axial lines and V-shaped markings. Size: 1½ inches in length.

BLACK DRILL SHELL—*Pseudomelatoma moesta* Carpenter

Shell spindle-shaped with long narrow aperture. Suture beaded below. Nine, short axial ribs on each whorl. Lives in rocky localities. Color: greenish-brown. Size: 1½ inches in length.

OLIVE SHELLS—Family *Olividae*

The Olive Shells are smooth, highly-polished and olive-shaped. They are chiefly tropical in their distribution and are usually found living in sandy locations.

CALIFORNIA PURPLE OLIVE SHELL
Olivella biplicata Sowerby

The California Purple Olives live in colonies on sandy beaches. They plow along just underneath the sand and leave a tell-tale track or ridge in the sand. They were used as ornaments by the early California Indians. Color: variable-white, pearl or dark gray or brown, trimmed with purple. Size: 1 inch in length.

WHEAT SHELLS—Family *Marginellidae*

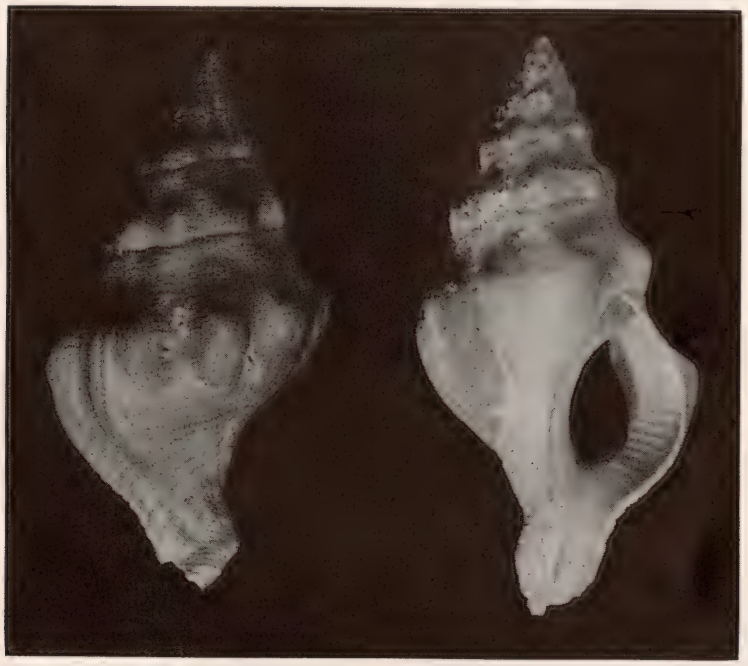
Small, highly polished shells with short spires and long apertures. A large family, chiefly tropical in distribution. Have characteristic plaits or cross ridges on the inner lip.

WHEAT SHELL—~~*Hyalina*~~ *californica* Tomlin

A glossy little shell shaped like a grain of wheat. Found under rough rocks at low tide. Color: cream with brown cross bands. Size: nearly ½ inch in length.

WHELK SHELLS—Family *Buccinidae*

Dull-colored shells with moderate or short canals and without folds on the columella. Live off shore in moderate to deep water. Aperture broadly notched at base.



KELLET'S WHELK
Kelletia kelletii Forbes

A large heavy spindle-shaped shell which lives at depth of 20 to 60 feet in rocky places. Carnivorous and often caught in lobster traps—being attracted by the bait within. Color: dull white often tinted green by encrusting algae. Size: 3 inches in length.

BASKET SHELLS—Family *Nassariidae*

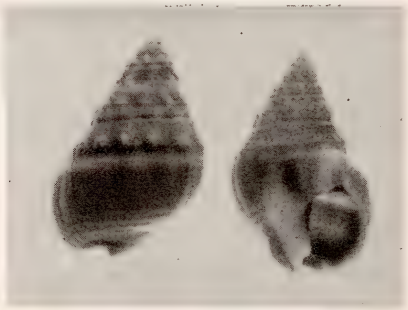
Most species of this family are found in warm tropical waters. Called "basket shells" because their reticulated sculpture resembles the meshes of English fish baskets. They are carnivorous and drill through other shells to feed on the animal soft parts. Are also scavengers. Live chiefly near shore in shallow water and prefer sandy or gravelly locations.

LEAN BASKET SHELL—*Nassarius mendicus* Gould

Lives in sandy bays. Slender with sculptured spiral lines and longitudinal ridges. Color: light brown outside, white within aperture. Size: 1 inch in length.

CHANNELED BASKET SHELL
Nassarius fossatus Gould

This largest West Coast species is channeled around the base. It is roughly sculptured by longitudinal and circular ridges. Common in Alamitos Bay. Color: yellowish-gray with orange in aperture and on columella. Size: 2 inches in length.



COVERED-LIP BASKET SHELL—*Nassarius tegulus* Reeve

Shell with short spire and round body-whorl. A characteristic white patch of enamel is present on inner lip. Common on mud flats. Color: brownish-gray. Size: ¾ inch in length.

LITTLE EAR SHELLS—Family *Ellobiidae*

Small shells with long narrow apertures and short spires; live in salt marshes and brackish water. They breathe by means of lungs instead of gills.

OLIVE EAR SHELL—*Melampus olivaceus* Carpenter

Common on mud flats where they crawl up the stems of plants. Seldom in the water. Color: brown with light circular band around the shell. Size: ½ inch in length.

DOVE SHELLS—Family *Columbellidae*

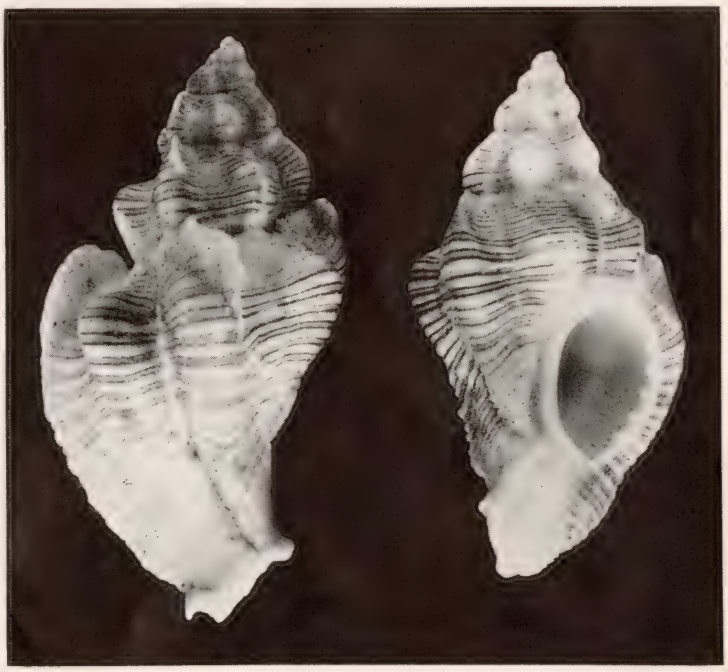
A large family of small shells that live in shallow water. The family name means "little doves." Few species reach 1 inch in length. Many are prettily colored with zig-zag designs.

JOSEPH'S COAT AMPHISSA—*Amphissa versicolor* Dall

Shell roughened by longitudinal and cross ridges. Crawls over under side of rocks. Easily obtained at low tide. Color: varies from yellow to red or brown. Sometimes variegated. Size: ½ inch in length.

ROCK SHELLS—Family *Muricidae*

One of the largest families of gastropod mollusks in point of numbers. The shells are usually spiny or nodulous, seldom smooth. Carnivorous in habit, they live near shore in shallow water with rocky bottom.

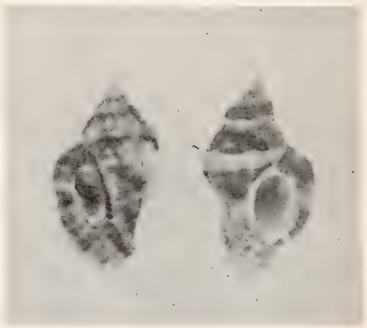


FESTIVE ROCK-SHELL
~~*Pterynotus*~~ *festivus* Hinds

Shell frilled with three longitudinal ridges on each whorl. Nodules present between frills. Canal of body whorl completely closed in fully grown individuals. A common species found clinging to rocks and wharf pilings and also crawling around mud flats. Color: white with brown stripes when cleaned of green algal stain and other material that often conceals the color. Size: 1½ inches in length.

CHANNELED ROCK SHELL
~~*Pterynotus*~~ *gemma* Sowerby
Maxwell

Outside surface pitted with depressions. Found clinging to the rocks at low tide. Color: white, circled with dark-brown bands. Size: 1½ inches in length.

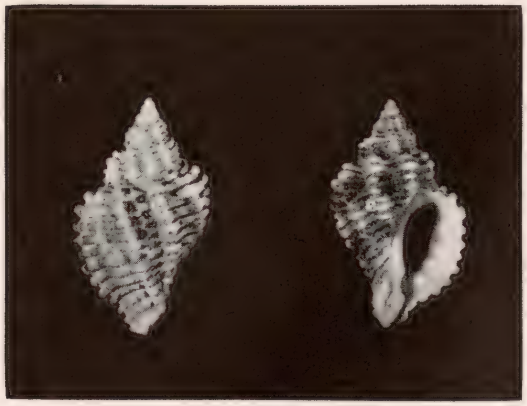


Ceratostoma
NUTTALL'S HORNMOUTH—~~*Pterorytis*~~ *nuttalli* Conrad

External structure consists of three longitudinal ridges with intervening knobs between. Fully-grown individuals have a sharp tooth present at the base of the outer lip. Lives in rocky places. Commonly found clinging to piling and floats. Color: varies from pure white to dark brown. Size: 2 inches in length: Named in honor of Thomas Nuttall, an early California conchologist.

POULSON'S ROCK SHELL—*Ocenebra poulsoni* Carpenter

Shell sculptured with low, rounding longitudinal ridges and revolving grooves. Teeth present within outer lip. Common on breakwaters, piling, floats and rocks. Color: gray outside, with narrow brown revolving lines between circular ridges; white within aperture. Size: 2 inches in length.

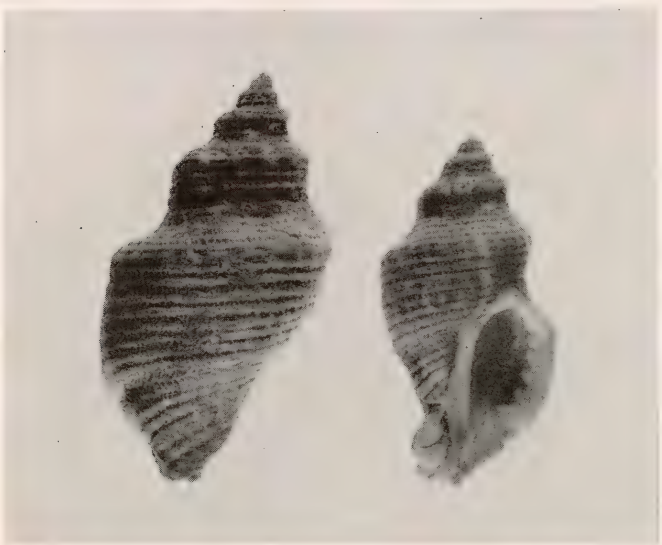


CIRCLED TRITONALIA—*Ocenebra circumtexta* Stearns

The surface of this shell is roughened by deep-cut ridges that give it a frilled appearance. The aperture is wide and teeth are present along the inner side of the outer lip. Inhabits rocky locations. Color: grayish-white, with wide, dark brown bands. Size: ¾ inch in length.

ROCK PURPLE—*Thais emarginata* Deshayes

Shell quite variable in shape and sculpture. Some shells are elongate but most of them are oval in outline. Circular ridges are usually present, but some individuals are nearly smooth externally. A rock-dwelling species common along the shore. Color: variable, usually dark brown, but occasionally dingy white with dark brown cross-bands. Interior of aperture brown. Size 1½ inches in length.



UNICORN SHELL
Acanthina spirata Blainville

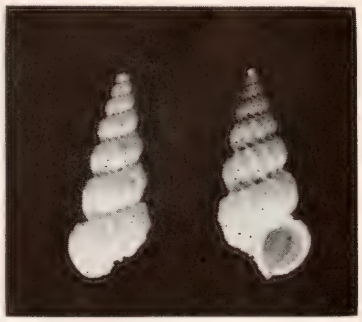
Shell with sharp tooth or spine at base of outer lip and small teeth on inside edge of outer lip. Common in mussel beds under sea-weed or under rocks. Color: white, with dark spiral lines. The true color is often concealed by thin, green algal stain. Size: 1 inch in length.

LADDER SHELLS—Family *Epitoniidae*

The Ladder Shells are delicate little shells with long, slender, pointed spires. They are pure white in color and are sculptured with narrow, longitudinal ridges. They live in sandy places from near shore to deep water.

SCULPTURED LADDER SHELL—*Opalia insulpta* Carpenter

This species lives near the base of sea anemones. The longitudinal ridges of the shell are reduced and are confined to the lower edge of the sutures. The live animal throws off a purple dye when placed in alcohol. Color: dingy-white. Size: ½ inch in length.



COOPER'S LADDER SHELL—*Epitonium cooperi* Strong

In this beautiful species, the longitudinal ribs or varices are set at an equal distance from each other. This Ladder Shell is found off shore in mud or sand. Color: pure white. Size ¾ inch in length.

COWRY SHELLS—Family *Cypraeidae*

Shells of this family are smooth and highly polished. Adults are oval in shape and inflated. The spire is hidden by the body whorl and the long aperture is provided with denticles along both lips. No operculum is present. A large family with most species living in tropical waters.

NUT-BROWN COWRY

~~*Zonaria*~~ *Cypraea spadicea* Swainson

This is the only species of cowry found north of San Diego on the Pacific Coast. It lives near rock ledges and feeds on small anemones, sponges, the egg capsules of other snails and algal encrustations on rocks. Color: rich chestnut-brown above, shading to white or gray or bluish along lower sides and underneath. Average size: 2 inches in length.

COFFEE-BEAN SHELLS—Family *Eratoidae*

These shells resemble small cowries in shape but they are not highly polished and the surface is sculptured with raised cross-ridges which extend down to the under surface to within the aperture. A median longitudinal groove extends down the center of the upper surface, separating the ribs into two areas. Most species are tropical in their distribution, only two species are common on the California coast.

CALIFORNIA COFFEE-BEAN SHELL—~~*Pusula*~~ *californiana* Gray

~~Trivia~~

Lives among the sea-weed in rocky localities. A smaller and darker species than the next. Color: purplish-brown; dorsal groove and ribs somewhat lighter. Size: less than ½ inch in length.

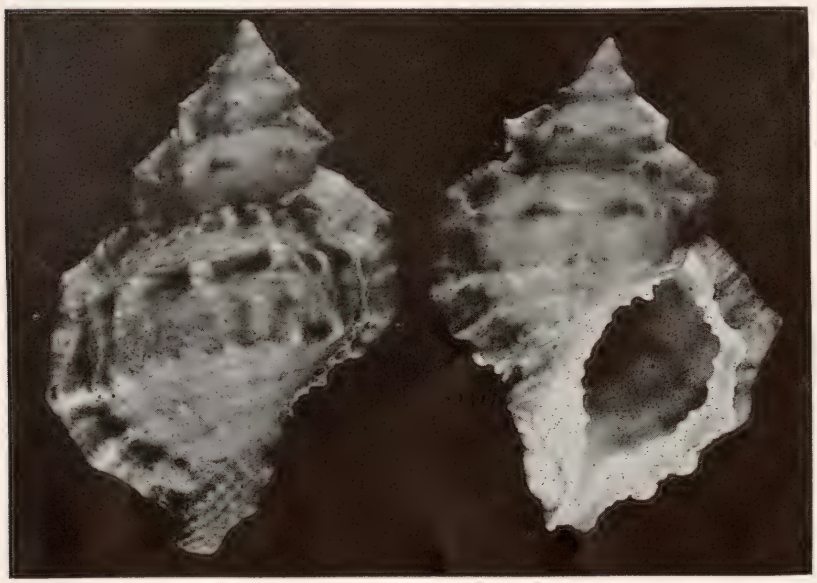
SOLANDER'S COFFEE-BEAN SHELL—~~*Pusula*~~ *solandri* Sowerby

~~Trivia~~

Much larger than the California Coffee-bean and with coarse ribs ending in nodules on the upper surface, along the median groove. Also found on sea-weeds in rocky places. Color: pinkish-brown, with ribs and median groove lighter. Size: over ½ inch in length.

FROG SHELLS—Family *Bursidae*

A family of large shells found chiefly in tropical seas. Two continuous, opposite ridges or varices are present on the spire and body whorl of the Frog-Shells. Intervening knobs or ridges are common on most species.



California Frog Shell
Bursa californica Hinds

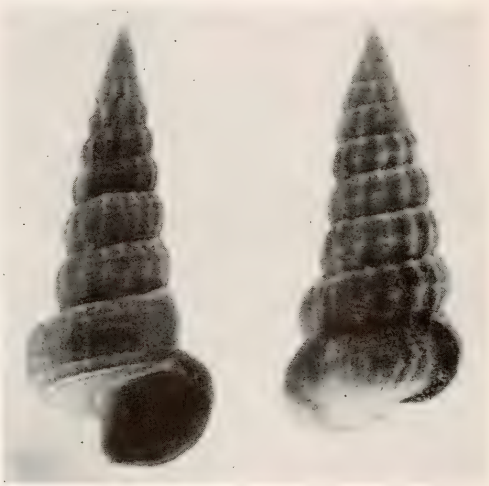
A large, solid shell with a wide aperture and noduled surface. Lives off shore in water of moderate depth. Outer lip toothed within and thickened by a varix or longitudinal ridge. Color: yellowish - brown; aperture white. Average size: 4 inches in length.

HORN SHELLS—Family *Cerithidae*

Shells with long slender spires and circular apertures. Found in shallow water near shore. They vary in color from white to nearly black and are seldom variegated with other colors. Most common in the tropics and usually found crawling on vegetation.

California Horn Shell
Cerithidea californica Haldeman

An inhabitant of mud flats where it can be seen in countless numbers at ebb tide. The shell is sculptured by strongly ribbed whorls and is provided with an operculum. Color: dark brown, nearly black. Size: 1¼ inches in length.



WORM SHELLS—Family *Vermetidae*

These mollusks live in calcareous tubes which they build singly or in colonies. The tubes are attached to corals or rocks or shells. An operculum is present in each individual.

SCALY WORM SHELL
~~*Aletes*~~ *squamigerus* Carpenter
~~Vermetus~~
Serpulorbis

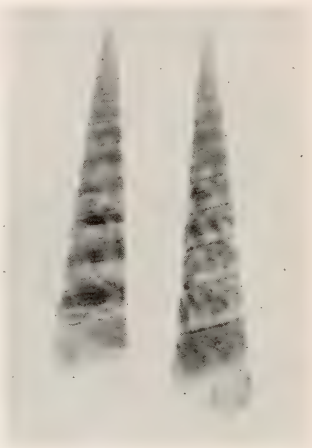
Usually occurs in clusters attached to large rocks near shore. The tubes are frequently twisted or are irregularly spiral and show shallow, longitudinal and circular ridges, giving them a scaly appearance. Color: yellowish-white. Size: ¼ inch in diameter and from 4 to 10 inches in length.

TOWER SHELLS—Family *Turritellidae*

Shells with long, slender spires and circular apertures. Most species live in tropical waters, near shore or in moderately deep water, where the bottom is sandy.

COOPER'S TOWER SHELL—*Turritella cooperi* Carpenter

Found crawling on sandy beaches at low tide. Also lives off shore on sandy bottoms. Spire with many whorls, tapering to a sharp apex. Color: yellow, spotted with reddish-brown. Size: 2 inches in length.

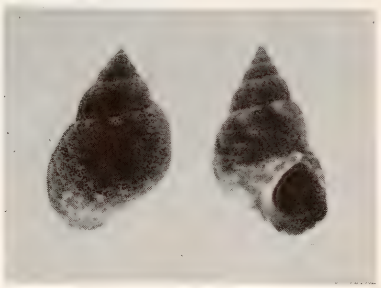


PERIWINKLES—Family *Littorinidae*

Shore-dwelling mollusks that live in rocky places. Spend a good deal of time out of the water, sometimes above the high tide mark. Provided with operculum. No umbilicus present. Cling to exposed rock surfaces or hide in rock crevices.

GRAY LITTORINE—*Littorina planaxis* Philippi

Lives on rocks, breakwaters, pilings and eel grass and becomes wet only at high tide. Easily recognized by the flattened columella of the inner lip. Color: brown or gray, often checkered with lighter markings. Size: ½ inch in length.

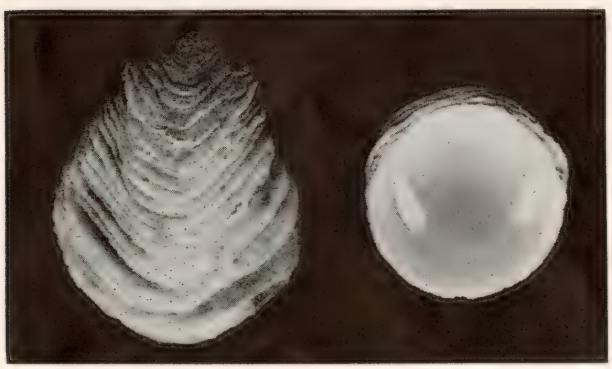


CHECKERED LITTORINE—*Littorina scutulata* Gould

Occurs just above the high tide line on rocks or salt grass upon which it feeds. More slender than the Gray Littorine and with longer spire and smaller aperture. Color: dark brown. Size: ½ inch in length.

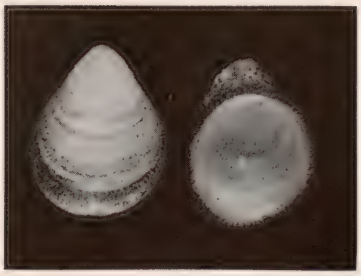
HORSE-HOOF SHELLS—Family *Hipponicidae*

Small shells with oval aperture, and more or less flattened; not coiled. Live attached to rocks. A family of few species.



ANCIENT HOOF-SHELL
Hipponix antiquatus L.

Shell flattened and roughened by concentric ridges. Apex near one end. Shape variable, usually conforming to the shape of the rock where attached. Muscle scar within aperture horse-shoe shaped. Color: dingy white. Size: ¾ inch in length.



HORN OF PLENTY SHELL—*Hipponix tumens* Carpenter

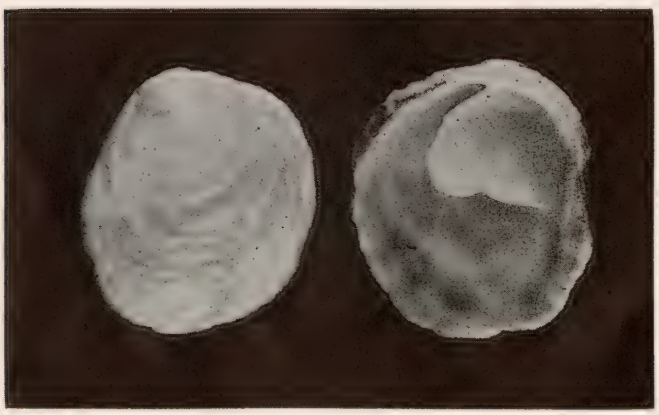
Shaped like a "horn of plenty" with apex curved downward at one end. Evenly sculptured by radial and concentric lines—the radial being most prominent. Lower part of shell, above aperture, sparsely covered with epidermal hairs. Color: white, except on area covered with light brown hairs. Size: ½ inch in length.

SLIPPER SHELLS—Family *Crepidulidae*

The shells of this family have a shelly plate within the aperture thus giving them the appearance of little slippers. The spire is reduced and frequently twisted. Apex usually terminal. Variable in shape and surface sculpture. Occur permanently attached to rocks and large shells. All feed on marine vegetation.

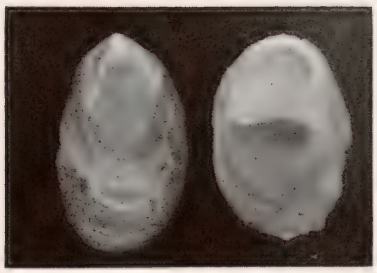
ONYX SLIPPER SHELL—*Crepidula onyx* Sowerby

This largest of California Slipper Shells is common everywhere along the coast where it fastens to other shells, rocks and crabs. Resembles a Chinese slipper in shape. Its surface is usually smooth, but sometimes it is sculptured by concentric growth lines or longitudinal ridges. Color: brown, except the white shelly internal plate or deck. Size: averages 1½ inches in length.



WRINKLED SLIPPER SHELL
Crepipatella lingulata Gould

Occurs on rocks with rough surface. Circular in shape with uneven upper surface. Thin and flattened, with partly detached deck within aperture. Color: brown, with white deck within aperture. Size: ½ inch in length.



WHITE SLIPPER SHELL—*Crepidula nummaria* Gould

Occurs attached to rocks and on or within larger shells. It is always flattened, but may be curved to fit the shape of the aperture of the shell within which it is fastened. It may be round, oval or elongate in shape and the surface smoooth or roughened by concentric, overlapping plates. Color: white. Size: 1½ inches in length.

MOON SHELLS—Family *Naticidae*

Moon shells are widely distributed and are most common in tropical waters. The shells are globular and heavy and are provided with either a shelly or a horny operculum. Carnivorous in their feeding habits, they prey upon clams that live in sandy places near shore.

SOUTHERN MOON SHELL—*Polinices reclusianus* Deshayes

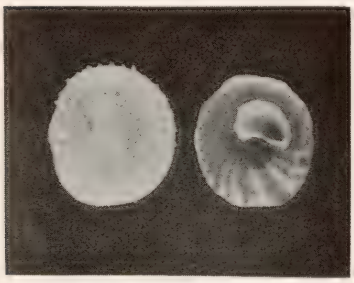
Occurs partially buried in the sand in bays and offshore. Shell usually globe-shaped, but sometimes the spire is produced to a point. Our most common species. Color: reddish-brown above shading to light tan below. Size: average size 2 inches in length.

LEWIS' MOON SHELL—*Polinices lewisii* Gould

This largest member of the Moon Shell family lives partially embedded in the sand of bays and offshore. In this species the umbilicus is open and not covered with enamel as in the Southern Moon Shell. Always globular in shape. Color: brown. Size· average size 3 inches, but may reach 5 or 6 inches diameter in very old shells.

HAT SHELLS—Family *Calyptraeidae*

Members of this family resemble miniature Chinese hats with their peaked apex and circular outline. All live attached to rocks or shells. A cup-shaped deck is present within the aperture.

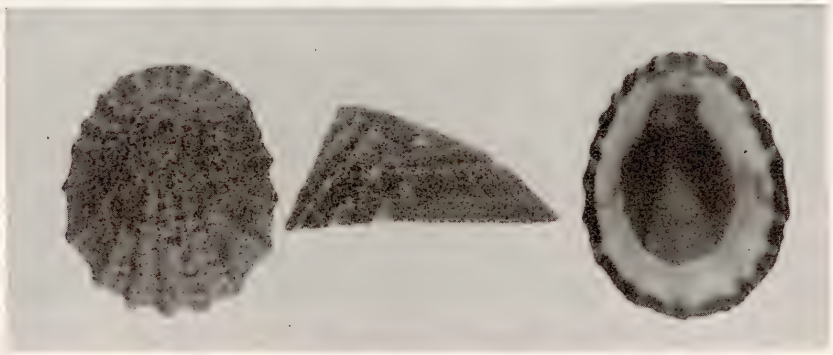


CUP-AND-SAUCER SHELL—*Crucibulum spinosum* Sowerby

A tent-shaped shell commonly found fastened to oysters, pectens and other bivalves. A triangular cup is present within the aperture, attached at one side. The upper surface is studded with small, short spines, especially numerous toward the margin. Color: brown. Size: 1 inch in diameter.

LIMPETS—Family *Acmaeidae*

The limpets are flattened or cone-shaped shells, without sutures or whorls, with large apertures and dark-stained muscle scars. All live near shore and are attached to rocks, seaweeds and shells. Some species are quite variable in their surface sculpture and color pattern. They are either round or oval in outline.

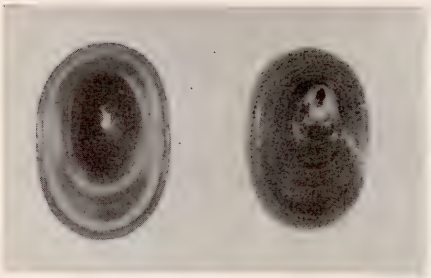


FINGERED LIMPET—*Acmaea digitalis* Eschscholtz

A common species with apex near end of shell and prominent ribs extending like fingers over upper surface. Color: greenish-brown with gray or white markings. Central area of aperture black and border black. Size: 1 inch in length.

FILE LIMPET—*Acmaea limatula* Carpenter

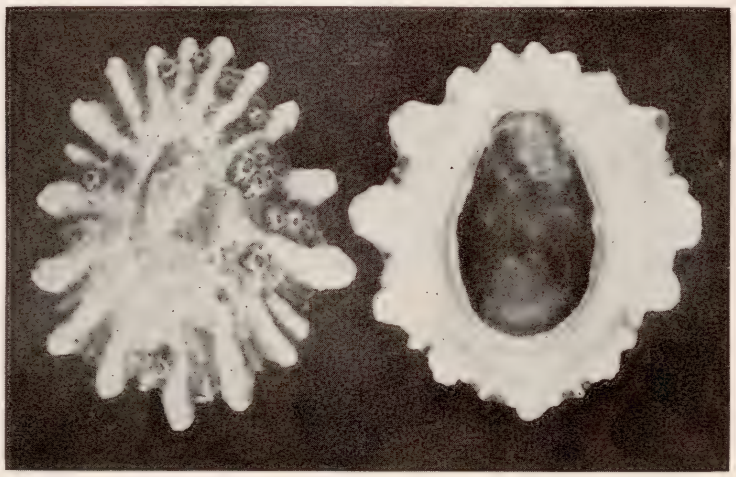
A flat, oval species that is very common on smooth rocks. The upper surface is roughened by radiating rows of tiny file-like teeth. Color: varies from yellowish-white to brown. Often green due to covering of algae. Size: 1 inch or more in length.



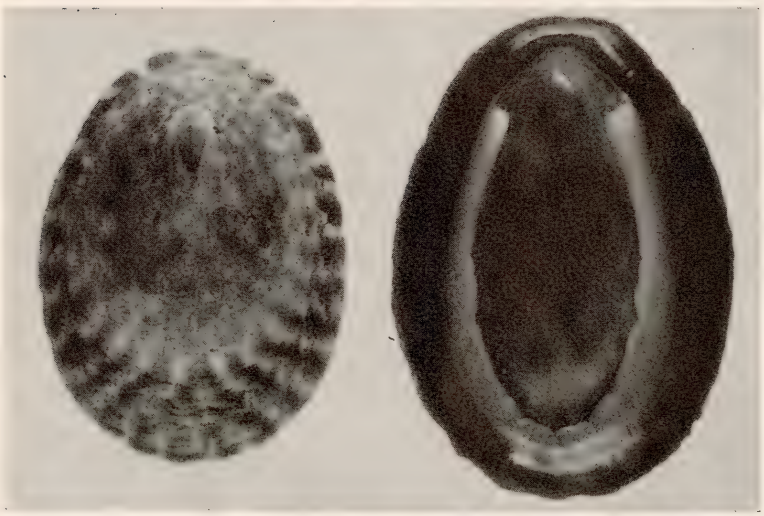
SEAWEED LIMPET—*Acmaea insessa* Hinds

Small, cone-shaped limpets that live attached to the central, flattened stems of brown kelp upon which they feed. Color: horn brown. Size: ½ inch in length.

Lives attached to rocks above the tide line. Upper surface roughened by coarse ribs. Margin of shell irregular. Color: dingy white or gray; aperture white except for dark central muscle scar. Size: ¾ inch in length.



ROUGH LIMPET—*Acmaea scabra* Gould

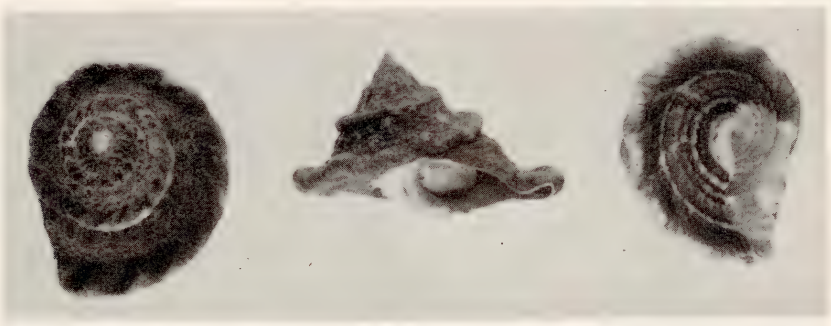


OWL LIMPET—*Lottia gigantea* Gray

Our largest limpet is found attached to outside rocks exposed to the pounding of the surf. It fastens on above the high-tide mark. The surface of the flat shell is roughened by rounded tubercules. Color: brown outside; aperture dark, with muscle scar shaped like the figure of an owl. Size: 2 to 3 inches in length.

TURBAN SHELLS—Family *Turbinidae*

Large, solid, turban-shaped shells that are most common in tropical waters. All are provided with a shelly operculum and no umbilical opening is present. The shells are pearly underneath the thin outer coating or skin-like periostracum. Their food consists of marine vegetation.

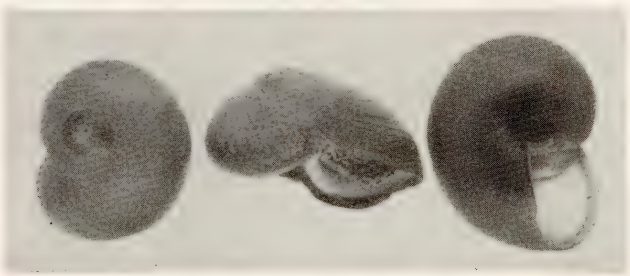


WAVY TURBAN SHELL—*Astraea undosa* Wood

Occurs in rocky localities and often seen in tide-pools at ebb tide. Outside surface uneven and noduled in wavy ridges. Top-shaped with flat base. Color: brown. Size: 5 to 6 inches in length when full grown.

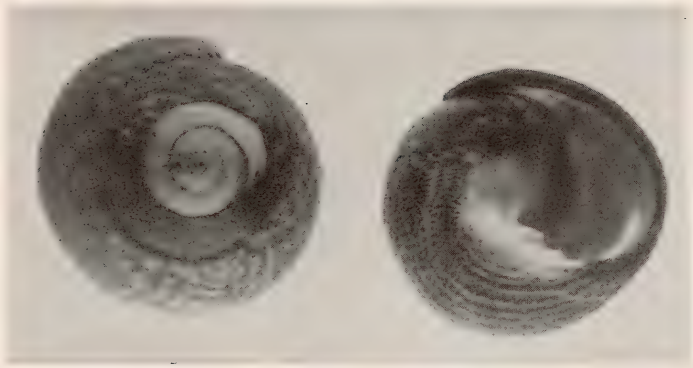
TOP SHELLS—Family *Trochidae*

The Top Shells live chiefly in shallow water near shore. They are usually turban-shaped or top-shaped and are provided with a thin, circular, horny operculum. All are vegetable feeders. Most species are found among rocks or coral formations.



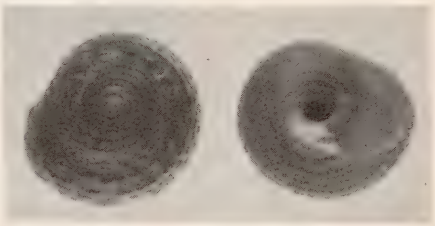
RED TOP SHELL—*Norrisia norrisii* Sowerby

Lives among the seaweed attached to rocks near shore or on the kelp offshore. A smooth, solid species, globular in shape, with large body whorl and greatly reduced spire. Outside sometimes nearly covered by Hooked Slipper Shells. Color: shell brown, with green stain around umbilicus; animal red. Size: 2 inches or more in length when full grown.



SPECKLED TOP SHELL
Tegula gallina Forbes

A turban-shaped species that lives among the rocks near shore. Sometimes found in large numbers at low tide. Color: speckled gray and white. Size: 1 inch in length.

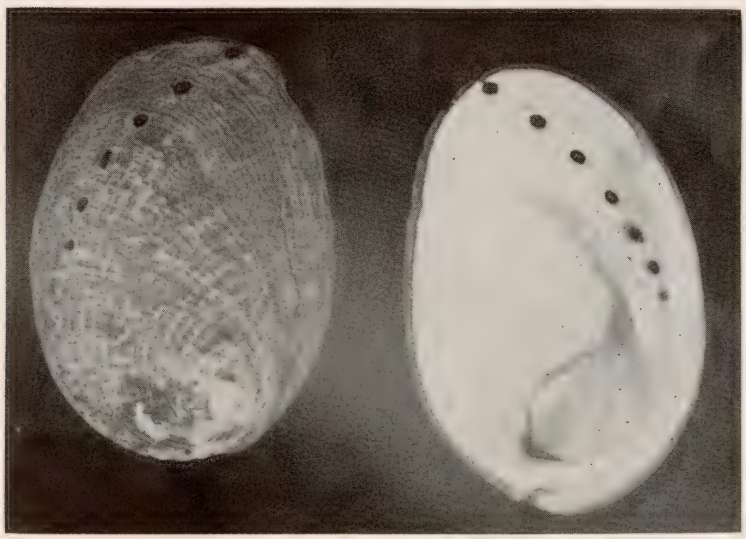


BANDED TOP SHELL—*Tegula ~~ligulata~~* ~~Menke~~ *eiseni* Ek. Jordan

Also turban-shaped. Sculptured with concentric, granulated, spiral ridges which give it a beaded appearance. Umbilicus large and columella dentate at base. Color: brown. Size: 1 inch in length.

ABALONES—Family *Haliotidae*

Often called "Ear Shells" because of the shape of their shells. Attach themselves to rocks and crawl around at times. Openings in their shells serve to release waste matter and aid in respiration. Shells are lined with layers of nacre or mother-of-pearl. Useful for food and ornament.

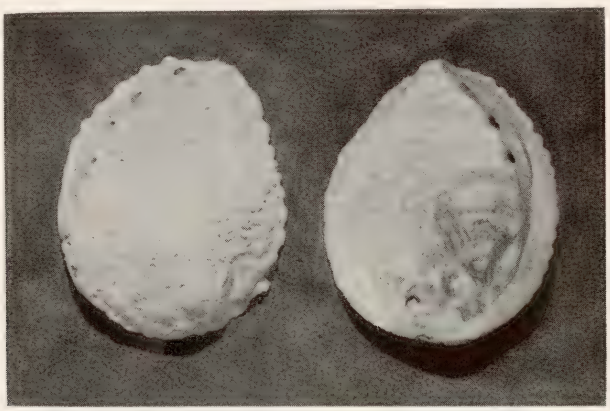


BLACK ABALONE
Haliotis cracherodii Leach

Our commonest species. Shell smooth, with 9 openings. Color: black. Size: 6 inches in length.

GREEN ABALONE—*Haliotis fulgens* Philippi

Shell roughened by ridges on upper surface. Six elevated openings. The foot is excellent for food. Sometimes called "Blue Abalone." Not common. Color: reddish-brown outside; iridescent greenish-blue within aperture. Size: 8 inches in length.

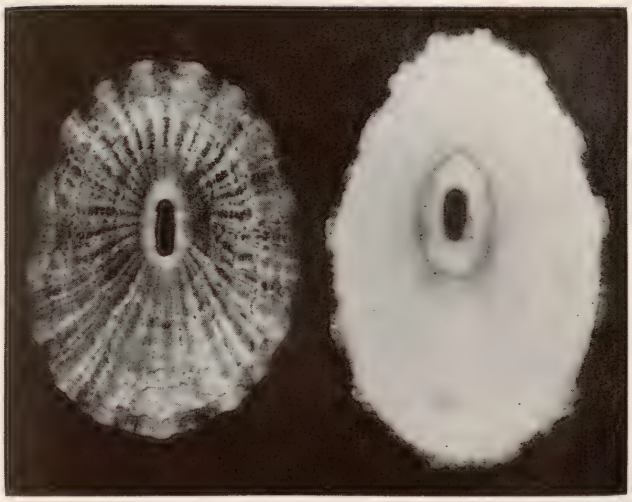


PINK ABALONE—*Haliotis corrugata* Gray

Sometimes called the "Corrugated Abalone" because of its rough upper surface. More circular in outline than the Black or the Green Abalone. Two or three elevated openings present. Lives offshore in water of moderate depths. Color: streaked with red and green on upper surface; interior silvery with pink shading. Size: 6 inches in length.

KEY-HOLE LIMPETS—Family *Fissurellidae*

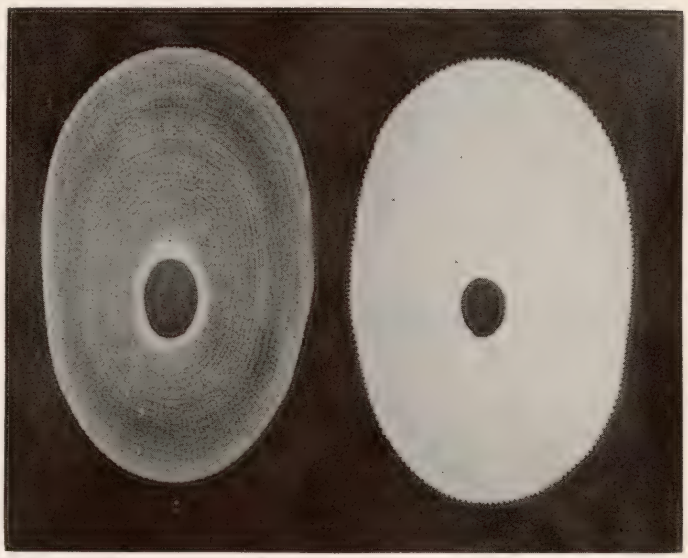
Flattened or cone-shaped shells without spiral whorls and with an apical opening. Crawl over the rocks near shore. Most numerous in tropical waters.



VOLCANO KEY-HOLE LIMPET—*Fissurella volcano* Reeve

This cone-shaped shell is our most common local species and may be found clinging to rocks at low tide. Color: pink with purple rays radiating from the apex to the margin. Size: 1 inch in length.

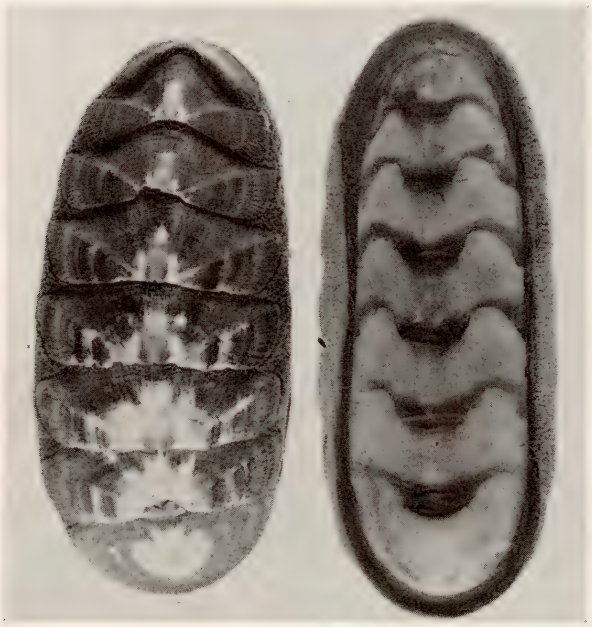
The largest of Key-hole Limpets. Clings to large rocks or breakwaters below the low tide line. The mantle extends over the top of the shell except for a narrow border around the apical opening. The shell is much flattened and sculptured with radiating ridges and concentric growth lines. Edge of shell crenulated. Color: mantle black, foot yellow; shell ash brown above, white within aperture. Size: 5 inches in length.



GIANT KEY-HOLE LIMPET—*Megathura crenulata* Sowerby

CHITONS—CLASS AMPHINEURA

Multivalve mollusks which have eight overlapping valves or plates held together by a leathery girdle. They fasten to rocks and seldom crawl from one location to another. All feed on marine vegetation. They are frequently called "Sea Cradles" and "Coat-of-Mail" Shells. Separate valves are often called "Butterfly Shells" because in shape, they are like a butterfly.

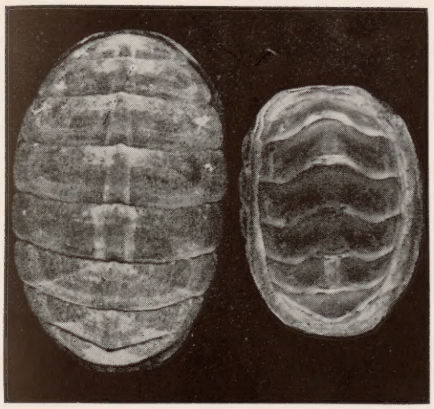


SHOWY CHITON
~~*Ischnochiton*~~ *conspicua* Carpenter
Stenoplax

This, our largest local species, is elongate in shape. It lives attached to the underside of large rocks. Short bristles cover the girdle. Color: upper surface, grayish-green; inside, green and pink.

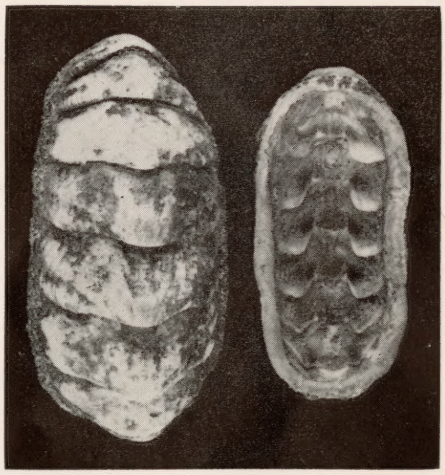
MOSSY CHITON
Mopalia muscosa Gould

Surface of valves sculptured with longitudinal and angled ridges. Girdle covered with moss-like bristles. Color: dark brown above; interior, bluish-green. Size: 2½ inches in length.



BLUE CHITON
~~Lepidochitona~~ hartwegii Carpenter

Oval in shape and nearly as wide as long, the Blue Chiton is common on the rocks at low tide. The valves are narrow and wide. Color: outside, green; interior, blue-green. Size: 1 inch in length.



SCALY CHITON—*Nuttallina ~~californica~~* Reeve

A narrow, elongate species with eroded valves and sculptured by tiny bead-like granules. Girdle spiny. Lives high up on the rocks. Color: dark brown above; interior, blue-green. Size: 1½ inches in length.

TUSK SHELLS—CLASS SCAPHOPODA

Mollusks with curved, tapering, cylindrical shells which are open at each end. In shape, they resemble miniature elephant's tusks. Occur half-buried in sand and gravel, with small end exposed.

HEXAGONAL TUSK SHELL
Dentalium neohexagonum Sharp and Pilsbry

Our most common species. Shell angled on the sides. Color: white. Size: ½ inch in length.

GLOSSARY

BIVALVES

Beak. The tip of the umbo.

Byssus. Bundle of threads used for attachment.

Cardinal Teeth. Central teeth of the hinge.

Cartilage Pit. Depression for the inner part of the ligament.

Growth Lines. Ridges deposited at growth intervals.

Hinge Teeth. Interlocking teeth that unite valves above.

Ligament. Cartilage that connects the valves.

Lunule. Heart-shaped area anterior to umbones.

Periostracum. Thin external skin covering.

Ribs. Elevated, parallel ridges.

Umbo. Swollen area above hinge line. Plural—umbones.

Valve. One of the two parts of a bivalve.

UNIVALVES

Aperture. Large opening in shell where the animal lives.

Apex. Tip of the spire.

Columella. Central pillar of shell, along inner lip.

Deck. Shelly plate in aperture of Slipper Shells.

Lips. Outer and inner edges of aperture.

Operculum. Protective plate attached to the animal, used to close aperture.

Reticulated. Sculptured by criss-cross ridges.

Suture. Seam between whorls.

Umbilicus. Small opening into lower end of the central pillar of the spire.

Varix. Greatly thickened cross ridge. Plural—varices.

Whorl. A complete turn of the spire. Largest whorl is body whorl which encloses the aperture.

CHITONS

Girdle. Muscular band around the margin of Chiton Shells.

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